

NON-PUBLIC?: N
ACCESSION #: 8711170241
LICENSEE EVENT REPORT (LER)

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FACILITY NAME: San Onofre Nuclear Generating Station, Unit 3

DOCKET NUMBER: 05000362

TITLE: Unit 3 Trip On Low Condenser Vacuum During Influx Of Seaweed
EVENT DATE: 10/11/87 LER #: 87-017-00 REPORT DATE: 11/10/87

OPERATING MODE: 1 POWER LEVEL: 077

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: H. E. Morgan, Station Manager TELEPHONE #: 714-368-6241

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 10/11/87 at 1010, with reactor power at 77%, flow direction through the circulating water intake and outfall tunnels was reversed to perform a heat treatment of the Circulating Water System. At approximately 1500, a heavy influx of seaweed occurred which led to the stoppage of one circulating water pump and a degradation of condenser vacuum. The operators began to normalize (return to normal alignment) the circulating water tunnels at 1646 in an attempt to reduce the effects of the seaweed influx. At 1702, the turbine tripped on low vacuum, causing the reactor to trip on loss of load. The Emergency Feedwater Actuation System for steam generator #2 (EFAS 2) actuated on low steam generator level. All components associated with EFAS 2 were verified to have operated in accordance with design.

The turbine trip on low vacuum resulted from normalizing the circulating water tunnels with one circulating water pump stopped during an ingress of large amounts of seaweed. Operating instructions for realigning the circulating water tunnels did not include adequate prerequisites that would have prevented normalizing the circulating water tunnels under these conditions.

The condenser water boxes were cleaned as necessary, and the unit was returned to power operation at 1530 on 10/12/87. This event will be discussed at shift briefings with Units 2 and 3 Operations personnel. Applicable operating instructions will be amended to include additional guidance on heat treatment

operations and seaweed influx/degrading vacuum scenarios.

(End of Abstract)

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Plant: San Onofre Nuclear Generating Station (SONGS)

Unit: 3

Reactor Vendor: Combustion Engineering

Event Date: 10/11/87

Time: 1702

A. PLANT CONDITIONS AT TIME OF EVENT:

Mode: (1) 77% Power

Circulating Water System tunnel alignment being returned to normal after heat treatment operation.

B. BACKGROUND INFORMATION:

1. Heat Treatment Information:

During heat treatment operations, flow in the circulating water intake and outfall tunnels is reversed and temperature is raised to eliminate the buildup of marine organisms which would cause excessive fouling of the Circulating Water System.

2. Reactor Trip Response Information:

The calculated response to a reactor trip from 75% power and observation of actual responses has shown that steam generator (SG) "shrink" will decrease level to a value near the Emergency Feedwater Actuation System (EFAS) (EIIIS System Code BA) setpoint, so an EFAS actuation may occasionally occur as a result of a trip from this power level. In this event, the SG #2 level reached the EFAS setpoint and EFAS 2 (EFAS associated with SG #2) actuated; SG #1 level did not reach the EFAS setpoint and EFAS 1 did not actuate, although level did decrease to within 1% of the setpoint.

C. DESCRIPTION OF THE EVENT:

1. Event:

On 10/11/87 at 1010, with reactor power at 77%, flow direction through the circulating water intake and outfall tunnels was reversed to

perform a heat treatment of the Circulating Water System (EIS System code NN). The heat treatment was completed at 1339, and the intake was returned to normal temperature at 1444. A heavy influx of seaweed then occurred, and one circulating water pump (EIS Component Code P) was secured at 1550 to reduce the fouling of the screens and rakes to prevent their damage. Vacuum began to degrade, and at 1646 the operators, in an attempt to reduce the influx of seaweed by utilizing the normal intake tunnel, began to normalize (return to normal alignment) the circulating water tunnels.

Vacuum continued to degrade, and at 1702, as the operators commenced a power reduction, the turbine (EIS Component Code TRB) tripped on low vacuum, causing the reactor (EIS Component Code RCT) to trip on loss of load. Plant conditions were stabilized and recovery proceeded normally.

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The Emergency Feedwater Actuation System for steam generator #2 (EFAS 2) actuated on low steam generator level. All components associated with EFAS 2 were verified to have operated in accordance with design. At 1715, steam generator #2 level was verified to be above the reset setpoint, and EFAS 2 was reset. Steam generator #1 level did not decrease to the EFAS 1 actuation setpoint.

The water boxes were cleaned as necessary, and the plant was returned to power operation at 1530 on 10/12/87.

2. Inoperable Structures, Systems or Components that Contributed to the Event:

None

3. Sequence of Events:

TIME ACTION

0742 Power reduced to 77% in preparation for heat treatment.

1010 Reversed flow direction in intake and outfall tunnels for heat treatment.

1050 Heavy influx of seaweed noted, heatup of intake halted.

1200(app) Influx of seaweed subsided; condenser conditions stabilized; continued heatup of intake to heat

treatment temperature.

1243 Intake at target heat treatment temperature, began heat treatment.

1339 Heat treatment completed, commenced cooling intake.

1444 Completed cooldown of intake.

1500(app) Another influx of seaweed occurred, causing increasing differential pressures across the condenser water boxes.

1550 Secured circulating water pump 3P117 to reduce the fouling of the screens and rakes.

1646 Commenced normalizing circulating water tunnels in an attempt to reduce the effects of seaweed by utilizing the (normal) intake tunnel for inlet water.

1702 As the operators started to reduce power, the turbine tripped due to low vacuum, resulting in a reactor trip on loss of load. EFAS 2 actuated due to steam generator level decrease following the trip.

1715 EFAS 2 reset.

1530 (10/12) After cleaning water boxes as necessary, Unit 3 was returned to power operation.

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4. Method of Discovery:

Control Room indications showed increasing differential pressure across the condenser water boxes and decreasing vacuum.

Control Room alarms and indications alerted the operators of the reactor trip.

5. Personnel Actions and Analysis of Actions:

One circulating water pump was secured when the influx of seaweed caused an excessively high differential pressure across the screens and rakes. The pump with the highest waterbox differential pressure was selected. This action was in conformance with procedure, and was

necessary to reduce the fouling of the screens and rakes to prevent their damage.

The operators next attempted to minimize the effects of the seaweed by returning flow direction in the circulating water tunnels to normal. Performing this evolution has the effect of relocating the suction of the Circulating Water System, which experience has shown can eliminate the seaweed influx.

Changing the Circulating Water System tunnel flow direction, either from the normal to the reverse flow direction or from the reverse flow to the normal direction, initially admits hotter water to the condenser inlet and causes an increase in condenser backpressure. With one circulating water pump secured and with the remaining three water box flows reduced due to partial blockage by seaweed or shell debris, the resultant peak in condenser backpressure from normalizing the circulating water tunnels was greater than the operators expected and reached the high backpressure trip setpoint. Operating instructions for realigning the circulating water tunnels did not include adequate prerequisites that would have prevented realigning the circulating water tunnels under the conditions present.

The operators expected condenser backpressure to increase as a result of returning the circulating water tunnel alignment to normal, but they did not anticipate that it would reach the trip setpoint. When it became apparent that condenser backpressure was increasing greater than had been expected, the operators initiated action to reduce power, but vacuum degraded rapidly and caused the turbine to trip prior to any significant power decrease.

The operators stabilized plant conditions utilizing the Standard Post Trip Actions (S023-12-1) and the Reactor Trip Recovery (S023-12-2) procedures. The operators also verified proper operation of EFAS 2 components.

6. Safety System Responses:

The Reactor Protection System operated in accordance with design, with no malfunctions being noted.

The Emergency Feedwater Actuation System for SG #2 (EFAS 2) actuated as a result of the steam generator level "shrink" in response to the reactor trip. All EFAS 2 components were verified to have actuated in accordance with design. EFAS 1 did not actuate since the level in steam generator #1 did not decrease to the actuation setpoint.

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D. CAUSE OF THE EVENT:

1. Immediate Cause:

The immediate cause of the reactor trip was a turbine trip on low condenser vacuum.

2. Intermediate Cause:

The seaweed influx caused the vacuum degradation and necessitated operator action to prevent a turbine trip; realigning the circulating water tunnels with one circulating water pump secured aggravated the degrading condenser vacuum.

3. Root Cause:

Operating instructions for realigning the circulating water tunnels did not include adequate prerequisites that would have prevented realigning the circulating water tunnels under the conditions present in this event. Procedural guidance on seaweed influx/degrading vacuum scenarios and attendant training were insufficient for operators to cope with this or similar scenarios.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

The water boxes were cleaned as necessary prior to returning the plant to power operation.

2. Planned Corrective Actions:

a. This event will be discussed at shift briefings with Units 2 and 3 Operations personnel.

b. Applicable operating instructions will be amended to include additional guidance on heat treatment operations and seaweed influx/degrading vacuum scenarios.

c. Appropriate training will be provided on the above instruction changes.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There are no reasonable or credible alternative conditions which could have increased the severity of this event.

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G. ADDITIONAL INFORMATION:

1. Component Failure Information:

Not applicable

2. Previous LERs on Similar Events:

On 3/10/84, a loss of vacuum caused a Unit 3 reactor trip (LER 84-008, Docket No. 50-362). The cause of that event, however, was the presence of water in the air removal piping. The corrective actions associated with that event are not applicable to this event.

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Southern California Edison Company

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U. S. Nuclear Regulatory Commission

Document Control Desk

Washington, D.C. 20555

Subject: Docket No. 50-362

30-Day Report

Licensee Event Report No. 87-017

San Onofre Nuclear Generating Station, Unit 3

Pursuant to 10 CFR 50.73(a)(2)(iv), this submittal provides the required 30-day written Licensee Event Report (LER) for an occurrence involving an actuation of the Reactor Protection System. Neither the health and safety of plant personnel nor the health and safety of the public was affected by this occurrence.

If your require any additional information, please so advise.

Sincerely,

/s/ H. E. Morgan

Enclosure: LER No. 87-017

cc: F. R. Huey (USNRC Senior Resident Inspector, Units 1, 2 and 3)

J. B. Martin (Regional Administrator, USNRC Region V)

Institute of Nuclear Power Operations (INPO)

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